Service Manual

Virtuoso

Mattress Replacement System

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Author: LINET
Related links: www.linet.uk.cz

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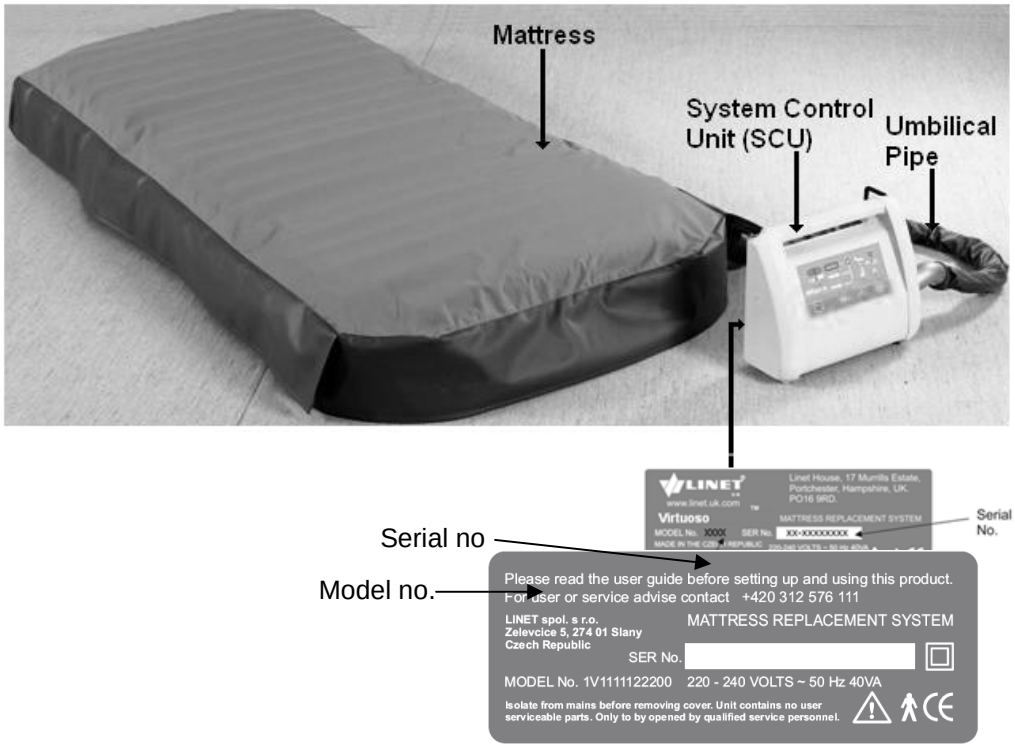
Useful Information

We thank you for purchasing our company's product and hope that you will be fully satisfied with the performance of your Mattress Replacement System throughout its service life. Because of our careful selection of materials and the latest production and build techniques, our Mattress Replacement System meets the parameters that guarantee high quality, reliability and constant value. Linet are dedicated to serving your needs and providing the best products available along with training that will bring your staff maximum benefit from our products. Please contact us if you have any questions about the operation or maintenance of your Mattress Replacement System. Before using your Mattress Replacement System, familiarize yourself with the various parts and controls as detailed in this Service Manual. Please read this Service Manual thoroughly before using your Mattress Replacement System. When making contact with Linet the following information is required:-

- The correct Name or Model number of your Mattress Replacement System.
- The correct Serial Number of your Mattress Replacement System.

Both can be found on the identification label as shown below. This is located on the rear of the SCU.


Mattress
System Control Unit (SCU)
Umbilical Pipe
Serial no
Model no.
Serial No.
Please read the user guide before setting up and using this product.
For user or service advise contact +420 312 576 111
LINET spol. s r.o.
Zelevcice 5, 274 01 Slany
Czech Republic
MATTRESS REPLACEMENT SYSTEM
SER No.
MODEL No. 1V1111122200 220 - 240 VOLTS ~ 50 Hz 40VA
Isolate from mains before removing cover. Unit contains no user serviceable parts. Only to by opened by qualified service personnel.

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1 Introduction

- The Virtuoso Mattress Replacement System is designed for hospital use in short and long-term care wards, intensive care units and high dependency units.
- This product is manufactured in accordance with international standards IEC EN 60601-1, EN60601-1-2, EN 60601-1-4 and EN ISO 10993.
- This product complies with the requirements of the EU Directive 93/42/EEC that stipulates the technical Requirements for medical equipment.
- This product complies with the EU Directive 89/336/EEC that stipulates the technical requirements for products with regard to their Electro-Magnetic compatibility.
- The manufacturer complies with the certificated quality management standards, EN ISO 9001:2000, EN ISO 13485:2003 and EN ISO 14001:2004.

The manufacturer will not be liable for any damage, injury, accidents which may arise because of carelessness or negligence. Safety Instructions regarding the operation of your Mattress Replacement System must be fully understood. Linet reserves the right to change/modify the content of this Service Manual when necessary.

Servicing should only be performed by qualified Linet personnel unless you have received formal Linet UK training beforehand.

Modifications to this product may only be performed by trained service personnel and with the authorisation of the manufacturer.

After repair or Modifications have been performed to this product appropriate inspection and testing must be performed in accordance with manufacturers and local hospital safety & maintenance instructions

Do not use your Mattress Replacement System SCU in the presence of flammable gases. This excludes oxygen cylinders.

2 Safety Instructions

- To ensure correct operation of your Virtuoso Mattress Replacement system, ensure the power supply available is 220V/240V AC, 50 Hz.
- To avoid electric shock, the Virtuoso SCU can be isolated from the electricity supply by un-plugging the mains plug from the wall socket.
- Keep your Virtuoso SCU away from radiators and other heat sources to prevent overheating.
- When in use ensure the SCU is not covered and that the airflow is not restricted.
- Ensure the mains power lead is routed to avoid a trip hazard.
- Do not coil the mains power lead when in use.
- Do not attempt to service your Virtuoso system unless you have received full service training and documentation from Linet.

Servicing should only be performed by qualified Linet personnel unless you have received formal training beforehand.

3 Risk Assessment

- Make sure your work area is adequately sized and suitably lit.
- Your working area should be free from clutter that could cause injury.
- Use good engineering and manual handling practices to reduce risk of injury.
- Tools and test equipment should to be kept in good condition.
- You must be adequately trained to perform the task.
- All systems should be presented for maintenance in a clean and in infection free condition.
- Precautions should be taken when inspecting an internal mattress or cushion components as punctured covers could present a level of contamination.
- Suitable protective garments should be worn, e.g. gloves, disposable aprons etc.
- On completion of maintenance wash hands thoroughly, dispose of all protective disposable garments and clean all tools and / or test equipment which may have become contaminated using an appropriate cleaner / disinfectant.
- You must comply with all local site safety rules, report all incidents or accidents to the site safety supervisor.

4 Control Panel Description

The Control Panel of the SCU is used to make adjustments to the mattress and also indicates fault conditions / service requirements. These are either visual (indicator lights) or audible. See figure 01.

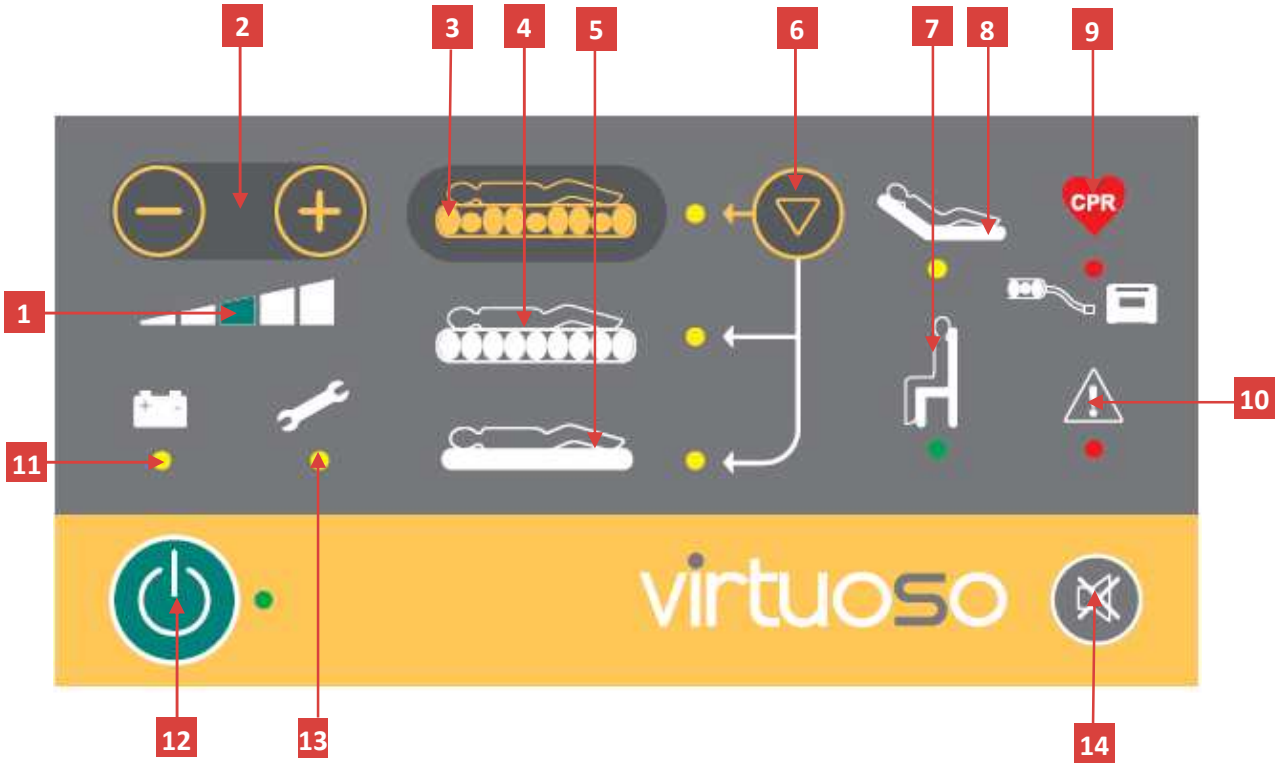


Fig 01

1. Pressure Adjust Indicator.	**8.** Backrest Raised Mode Indicator.
2. Pressure Adjustment Control.	**9.** CPR or Air Disconnected Mode Indicator.
3. Alternating Mode Indicator.	**10.** System Fault/Warning Mode Indicator.
4. Static Mode Indicator.	**11.** Battery Condition Monitoring Indicator.
5. Evaluation Mode Indicator.	**12.** 'GO' Button Control.
6. Mode Select Control.	**13.** Service Mode Indicator.
7. Seating Mode Indicator.	**14.** Audio Alarm Mute Control.

4.1 (1 & 2) Pressure Adjustment (Alternating Mode only)

On initial start up the system will set itself to its recommended standard operating pressure level. The green section of the 'pressure' adjustment indicator will be permanently illuminated when this has been achieved. To ensure optimum protection is maintained the mattress will adjust automatically for any changes in the patient's weight or position every 7.5 minutes.

The pressure adjustment control allows caregivers to adjust pressures within a safe pre-set range to provide patients with enhanced comfort or support whilst maintaining a very good level of protection and therapy. Qualified clinical advice should always be taken before adjusting mattress pressures.

The two pressure settings below the recommended optimum setting, shown by the green light on the pressure adjustment indicator, can be used to increase comfort for the smaller or lighter patient's whilst the two pressure settings above the recommended optimum can be used to provide additional support should the patient be sitting up in bed or have a body shape or position that may concentrate the effect of their weight into smaller areas of the Mattress.

The required pressure is selected using the +/– controls to move the pressure by one or two steps away from its recommended standard operating pressure level. The yellow light corresponding to the required pressure setting will flash whilst the pressure is adjusting and will become permanently illuminated when this has been achieved.

4.2 (3) Alternating Mode (Default Mode)

When the First Inflation has completed, the system will automatically go into 'alternating' mode (a single audible alarm will sound) and the mattress cells will start to inflate and deflate (cycling). In this mode the system will be running 3 cells in 7.5 minute alternating cycle and the 'alternating' yellow light indicator will be continually illuminated. When changing the SCU mode the yellow indicator will flash for the new mode you have selected until the mattress pressure has reached its required pressure setting.

4.3 (4) Static Mode

In this mode all cells inflate to a single pressure setting to provide a firm and stable surface for nursing procedures. The yellow light will indicate the selection of this mode. On initial selection the yellow light will flash until the mattress pressure has reached its required pressure setting.

Static mode will run for a maximum of 30 minutes or until the caregiver selects a different mode. A single audible alarm will sound every 30 seconds during the last 5 minutes of the 30 minute 'static' period.

If another mode is not selected then the system will revert back to 'alternating' mode after the 30 minute period.

This mode can be re-selected for an additional 30 minutes if selected within the last 5 minutes of the first 'static' mode selection, or by selecting the 'alternating' mode and then re-selecting 'static' mode. If the 'static' mode is reselected a double audible alarm will sound every 30 seconds within the last 5 minutes of the 30 minute 'static' period.

In both cases a long single audible alarm will sound to indicate the end of the 'static' period.

Any attempt to re-select this mode for a third time will not be possible until the system has been running in alternating mode for a minimum of 30 minutes

4.4 (5) Evaluation Mode

In this mode a patient's condition evaluation can be made. The yellow light will indicate the selection of this mode. On initial selection the yellow light will flash until the mattress pressure has reached its required pressure setting. When in this mode a single audible alarm will sound every 2 hours to remind the carer that this mode has been selected. The alarm can only be cancelled by using the alarm mute button, or by changing modes i.e. to 'alternating' or 'Static' mode.

When exiting this mode (end of evaluation) a single long audible alarm will sound indicating that the SCU is changing modes.

It will not be possible to re-select this mode until the system has been running in alternating mode for a minimum of 30 minutes.

4.5 (6) Mode Select

This button allows the caregiver to select either 'alternating', 'evaluation' or 'static' mode. When pressed the desired mode can be selected and the selected mode will be indicated by a yellow light.

NOTE: The system will not allow 'static' or 'evaluation' modes to be selected during initial inflate and at other certain times. See section 4.3 and 4.4.

4.6 (7) Seating Mode

When the seat is connected to the SCU, the 'seating' mode green light will automatically illuminate. On initial selection the green light will flash until the seat pressure has reached its required pressure setting. Once pressure has been reached the green light will be continually illuminated. In this mode the system will be automatically run, 2 cells alternating in a 12 minute cycle.

NOTE: Pressure adjustment is not available in this mode.

4.7 (8) Backrest Raised Mode

This mode is automatically activated when the Backrest is raised to an angle of at least 15 degrees and has come to a stop. The yellow light will illuminate and stay on until the back rest has been lowered again.

The mattress pressure will automatically be set to its maximum or 2 pressure settings above the setting that is in use at the time (only if the system is set at the standard level or lower). On raising the Backrest and its has remained still for 7 seconds the yellow light will illuminate and will continue to flash until the mattress pressure has reached its required pressure setting.

When the Backrest is lowered and has come to a stop the mattress pressure will revert back to its original setting after 7 seconds. The pressure adjust indicator will show that the system has reverted back to its original pressure setting.

4.8 (9) CPR or Air Disconnected Mode

This mode will be automatically activated if the Umbilical Air Connector has not been correctly inserted, or if the Umbilical Air Connector has been removed during use. When activated the red CPR light will be continually illuminated and an uninterrupted alarm will sound. If the CPR has been deliberately activated, i.e. removal of the Umbilical Air Connector, the Mattress will rapidly deflate. To silence the alarm:-

- Refit the Umbilical Air Connector
- Switch the SCU to Standby Mode and cancel the audible alarm
- Switch off the SCU using the illuminated green power switch on the side of the SCU.(Vituoso plus only)

4.9 (10) System Fault/Warning Mode

If a 'System Fault' occurs, the red fault light will start flashing and an audible alarm will sound. The flash sequence of the light will be synchronized with the audible alarm (see section 10 for fault codes). To silence the alarm the 'audio alarm mute' button can be pressed, or the system can be reset by switching the SCU off and then back on again. In either case, unless the fault condition is not cleared, the fault alarm will return.

4.10 (11) Battery Condition Monitoring Light

If the optional Battery Back-Up pack has been fitted to your SCU then it is advised that SCU battery is charged prior to use. To charge the battery the SCU will need to be connected to the electrical mains supply. To determine the battery charge level, see the table 01.

Yellow warning Light	Battery condition *(Yellow Charge Light displayed on the SCU Control Panel)*
Light illuminated	The battery is fully charged.
Fast pulsing light	The battery charge level is greater than 50% and less than 100%.
Slow pulsing light	The battery charge level is greater than 25% and less than 50%.

Table 01

In normal use with the SCU connected to the electrical mains supply the Battery conditioning light will either illuminate yellow or flash, depending on charge status. If the electrical mains supply is removed, when the SCU is in use, the light will continually illuminate. With a fully charged battery the Mattress Replacement System will continue to operate for up to 6 hours in alternating mode.

If mains power is lost and the Battery Back-Up is discharged / disconnected then the SCU Power Fail alarm will sound. When the power is restored the alarm can be cancelled by pressing the 'Audit Alarm Mute' button. Once pressed the 'Fast Inflation' mode will need to be selected.

4.11 (12) Go Button

On Virtuoso the ‘GO’ button is used to activate the SCU Control Panel. Before any setting adjustments can be made the ‘GO’ button must firstly be pressed and held for 2.5 seconds until all front panel lights come on and single audible tone is heard.

The Virtuoso Plus has a separate power on/off control on the side of the SCU and the GO button is just used for panel activation as described below.

Then if no adjustments are made within a 3 minute period of pressing the ‘GO’ button the system will inhibit the use of all SCU controls and therefore the ‘GO’ button will need to be pressed until a single audio tone is heard to activate the SCU Control Panel.

4.12 (13) Service Mode

The ‘Service Mode’ light will only illuminate amber when the SCU has run for 10,000 hours since its last service. This indicates that the Mattress Replacement System requires servicing. When the light illuminates Linet service should be contacted. Contact details are detailed on page 25 of this Service Manual. This indicator can only be reset using the SDIU

4.13 (14) Audio Alarm Mute

All audible alarms can be silenced by pressing the ‘Audible Alarm Mute’ button. If silenced, when the SCU is in use, the alarm will restart after 30 minutes unless the fault condition has been rectified. Power fail audio alarms will remain muted.

If the Audible alarm sounds because of a power failure, the audible alarm will cancel if the power is restored or a Battery Back-Up pack is fitted.

5 Tools and Test Equipment

A general engineering tool kit is required for maintaining your Mattress Replacement System. In addition, certain specialist tools and test equipment are required. These are detailed below.

- Mattress Test Adaptor (S7000184)
- Pressure Gauge Test station (D7000315).
- Digital Pressure monitor station (D7000316)
- PAT1000 or Equivalent - Electrical Safety Tester.
- Multi-meter.
- Service Date Interface Unit (SDIU)(S7000260)
- 4mm Hexagonal Key.
- Screw drivers (10mm & 15mm Torx) (PZ 1 & 2)

6 Recommended Service Spares (see spare parts manual for full details)

Item Description	Quantity
SCU Filter Pack	1
Mattress Cover Top Kit	1
Mattress Cover Bottom Kit	1
Tubing Service Kit	1
Strapping Service Kit	1
Torso Section Tubular Repair Insert	1
Leg Section Tubular Repair Insert	1
Fastening Service Kit	1
Patch Repair Kit Pack	1

7 System Performance Test

The System performance test is a complete test of the SCU and the Mattress to ensure it correctly functions. The test sequence detailed below must be followed post service, or when any major components have been replaced.

7.1 System Connection

7.1.1 Insert the Air Connector (1) into the Test Adaptor (2) and insert the Air Connector/Test Adaptor into the SCU as shown in figure 02. Connect the Backrest Raise Loom to the SCU (3) and connect the four Test Adaptor pipes to the corresponding Sphygmomanometer test gauges i.e. 'C' to 'C', 'H' to 'H', 'A' to 'A' and 'B' to 'B'. Plug the SCU mains cable into an available electrical mains outlet and ensure the SCU green mains light is illuminated.

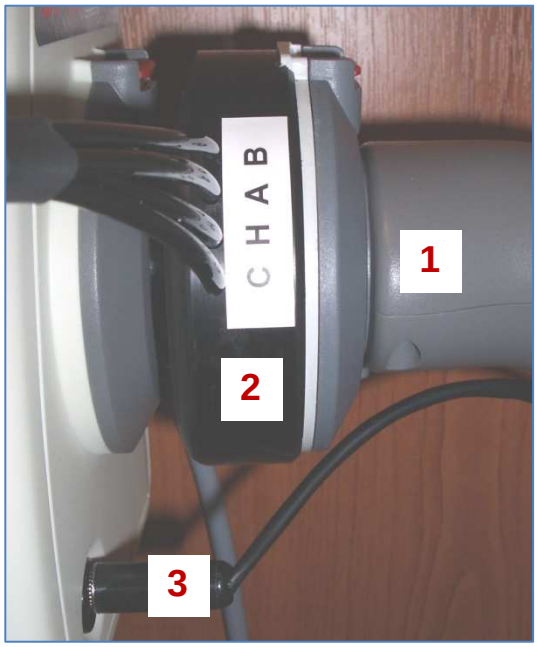


Fig 02

7.2 SCU Power on Test

7.2.1 Switch on the SCU by holding the 'Go' Button' for 3 seconds (not required if virtuoso plus). There will be a short delay while the SCU performs its initialisation checks, during this time the rotor can be heard turning. All SCU Control Panel lights should then illuminate once and an audible alarm should sound during initialisation. (Note Virtuoso manufactured from January) 2010 onwards with version 2.35 software or later will not do this but go straight into fast inflate The system should go into the 'fast' inflation process the yellow 'static' indicator should flash. When full inflation is achieved the SCU green 'alternating' indicator should illuminate and the flashing amber 'static' light should extinguish. At this point all cells should have reached the pressure of 45mmHg.

7.3 Pressure Tests

7.3.1 Alternating Mode

When the SCU has completed 'fast' inflation all of the cells should have reached the pressure 45mmHg (+/-5mmHG). At the start of the cycle 'A' cell will dump to atmosphere and then re-inflate. When the 'A' cell achieves 45mmHg 'B' cell will dump to atmosphere. This cycle will continue for 'A', 'B' and 'C'. The 'H' cells (Head Cells) should be continually set at 45mmHg. Using the Sphygmomanometer test gauges ensure that each cell achieves a pressure of 45mmHg (+/-5mmHG)., does not drop by more than 10mmHg during its inflated period and the cells inflate in the correct order during the cycle. The total cycle time for all 3 cells to inflate and deflate is 7.5 minutes. See figure 03 for mattress cell cycle

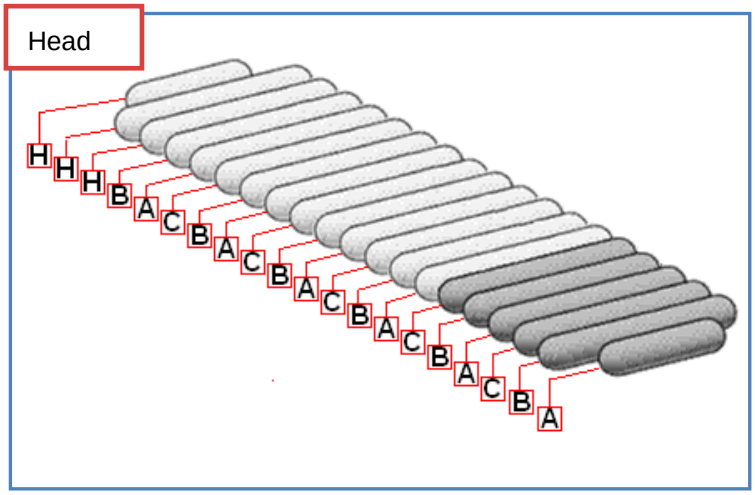


Fig 03

7.3.2 Alternating mode (Backrest Raised)

Raise the head section of the mattress to 30°s or m ore. The yellow backrest light on the SCU panel should illuminate and stay on until the back rest has been lowered again.

NOTE: The backrest light will illuminate approx 10 seconds after the backrest has been raised.

The mattress cells will automatically be set to a pressure of plus two levels (if available). This will be indicated when the SCU Control panel yellow light stops flashing. As per section 7.3.1, monitor the cell pressures and ensure they achieve a pressure setting of 60mmHg. (If pressure set at 45mmhg before back rest raised)

7.3.3 Static Mode

Set the SCU to static mode using the mode select button. The selection of this mode will be indicated by a yellow flashing light. When all mattress cells have achieved their pressure setting the yellow light should stay illuminated. Using the Sphygmomanometer test gauges ensure all cells achieve the pressure setting of 45mmHg +/- 5mmHg.

7.3.4 Evaluation Mode

Set the SCU to assessment mode using the mode select button. The selection of this mode will be indicated by a yellow flashing light. When all mattress cells have achieved their pressure setting the yellow light should stay illuminated. Using the Sphygmomanometer test gauges ensure all cells achieve the pressure setting of 30mmHg +/- 5mmHg.

7.4 Alarm Tests

7.4.1 CPR Alarm

While the SCU is switched on remove the Test Adaptor. A continual audible alarm should be heard and the CPR light should flash. Replace the air connector the audio & visual alarms should stop.

7.4.2 Power Fail Alarm

While the SCU is switched on remove the SCU mains power. The power fail alarm (intermittent two tone alarm) should be heard. Replace the mains power this should silence the alarm.(note After long periods of not being used the SCU must be connected to the mains power for at least 5 minutes before performing this test to allow the back up alarm to charge)

7.5 Control Panel Lockout

The ‘GO’ button is used to activate the SCU Control Panel before any setting / adjustments can be made.

7.5.1 Allow the SCU to run untouched for 3 minutes. Confirm that without pressing the ‘GO’ button the SCU control panel is locked from use.

8 Service Procedure

Only personnel trained or formally approved by Linet in the operation and maintenance of your Mattress Replacement System may perform maintenance, modification or repair work. Unqualified personnel attempting to work on Linet products risk serious injury to themselves / others and possibly death by electrocution.

The test equipment used for Servicing must be calibrated and traceable to National Standards. Records and results of tasks must be retained by the maintainer and / or the user for future reference.

8.1 Annual Schedule

It is recommended that your Virtuoso Mattress Replacement System is part of your planned Preventative Maintenance Programme. The minimum service interval Linet recommend is annually. See section 9 for full list of recommended checks. Instructions for performing some of these checks are given below.

8.2 Electrical Testing

Electrical safety checks must be carried out prior to working on the equipment and on completion of any routine maintenance or workshop repairs. Using an Electrical Safety Tester that meets the Technical Specification requirements the following test must be performed:-

- 500 Volt Insulation Test

Servicing should only be performed by qualified Linet personnel unless you have received formal training beforehand.

8.3 SCU Servicing (External)

8.3.1 Disconnect the SCU from the mains supply.

8.3.2 Visually inspect the electrical mains cable for any signs of damage. Replace if necessary.

8.3.3 If fitted, visually inspect the fuse rating in the mains plug, replace if necessary.

8.3.4 Visually inspect the SCU Housing, Front Panel, Display Membrane, Air Connector and the Hook Assembly for mechanical damage. Replace where necessary.

8.3.5 Remove and replace the SCU Filter. The filter must be replaced irrespective of whether it looks visually clean. Ensure that when fitting the replacement filter it's securely fitted into the front cover aperture. See figure 04.

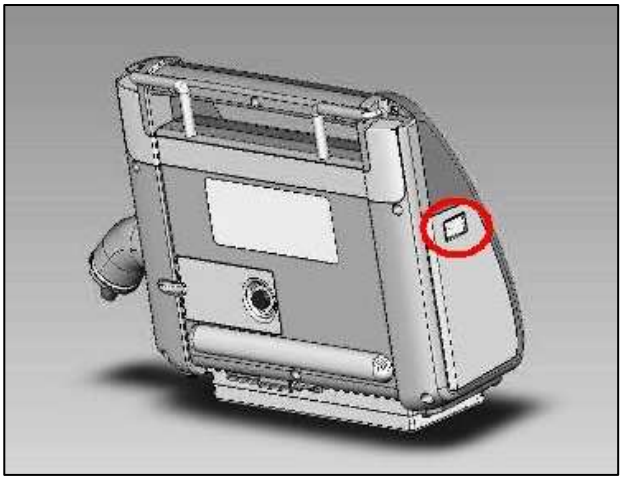


Fig 04

8.3.6 Using your SDIU interrogate the SCU fault log to ensure there are no recurring fail codes recorded within the last 100 power on hours. Recurring fail codes must be investigated as this may indicate an imminent failure. For SDIU use see section 10.

Fail-codes are time stamped i.e. if the total power on hours of the SCU is 900 hours then all recorded fail codes from 800 hours onwards must be investigated.

8.3.7 On completion of servicing the SCU the power on hours must be re-set. The re-setting of the power on hours is detailed in section 10.3.

8.3.8 Using an Electrical Safety Tester ensure the SCU passes the 500 Volt Insulation Test.

8.3.9 Wipe the SCU over with a disinfectant cloth ensuring all dirt and dust particles are removed.

8.4 SCU Servicing (Internal)

8.4.1 Remove the 10 rear cover screws as shown in figure 05. Gently lift the front cover to expose the Keyboard / Control PCB Ribbon cable. Disconnect the Ribbon cable from the Control PCB; the front cover can then be removed.

> When disconnecting the Ribbon cable from the Control PCB do not pull on the Ribbon Cable as this may damage the electrical contacts.

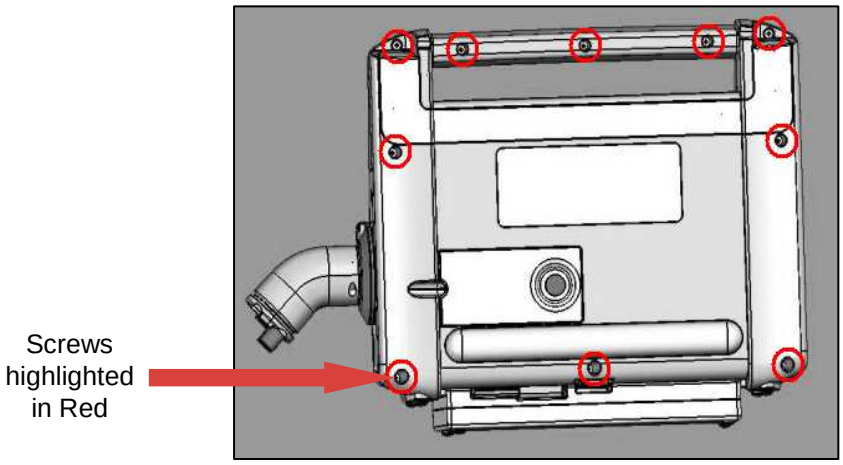


Fig 05

8.4.2 Visually inspect all of the wiring looms for signs of damage. Replace if necessary.

8.4.3 Visually inspect all of the pipes for signs of damage and internal dirt / dust. Replace if necessary.

8.4.4 Check Pressure Sensor pipes order of connections are as shown in figure 06.

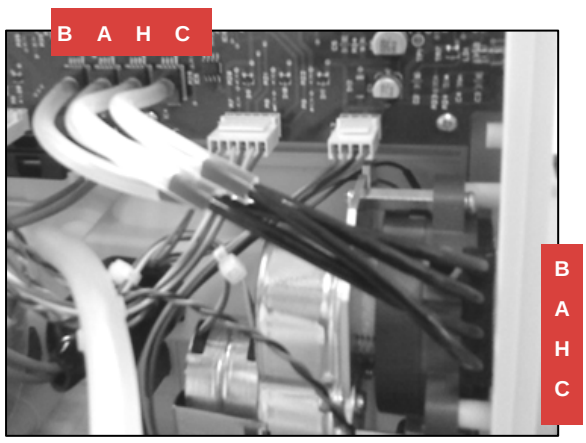


Fig 06

8.4.5 Visually inspect the 2 x 1 amp Ceramic Power Supply PCB fuses. Ensure they are rated at the correct value. See figure 07.

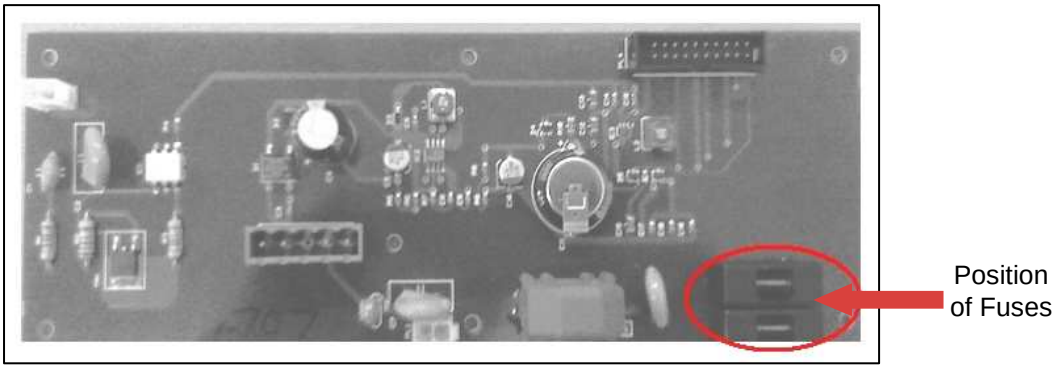


Fig 07

8.4.6 Re-fit the front cover, Keyboard to Control PCB Ribbon Cable and secure the front cover with the 10 retaining screws.

8.5 Mattress Servicing (External)

8.5.1 Visually inspect the Upper and Lower Mattress covers together with the Cable Management clips for signs of damage or deterioration including staining of the white inside cover surface. Replace if necessary.

8.5.2 Visually inspect the Umbilical Hose cover for signs of damage or deterioration. Replace if necessary.

8.5.3 Visually inspect the Mattress cover security straps for signs of damage or deterioration. Replace if necessary.

8.5.4 Visually inspect the Backrest cable for signs of damage or deterioration. Replace if necessary.

8.6 Mattress Servicing (Internal)

8.6.1 Un-zip the Upper and Lower Mattress covers and remove the Top and Bottom deck 'H' clips (Non-Umbilical Hose side) to allow access to the Top / Bottom deck piping. See figure 08.

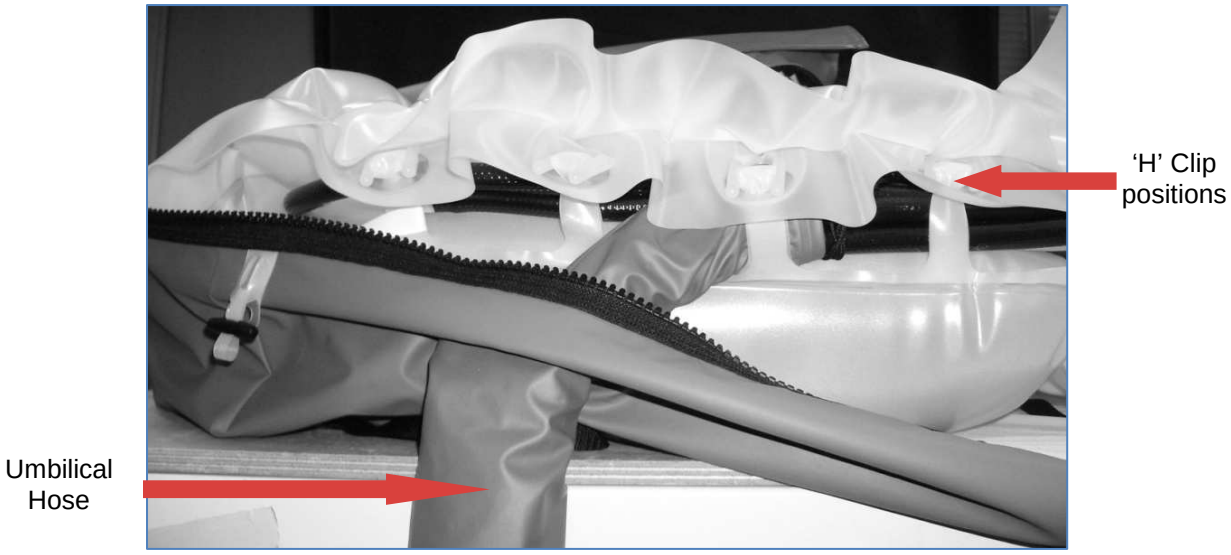


Fig 08

Note: The umbilical side of mattress is shown in Fig 8. For ease of inspection it is recommended to remove the 'H' clips on the Non-umbilical side of the mattress.

8.6.2 Visually inspect the pipes and connectors for correct fitment, signs of damage or deterioration. Re-fit / replace if necessary.

8.6.3 Visually inspect the Top and Bottom deck air cells for signs of damage or deterioration. Replace if necessary.

8.6.4 Re-fit the 'H' clips and replace the Upper and Lower covers.

8.6.5 Visually inspect the Umbilical Air Connector for signs of damage i.e. deterioration, cracking or splitting. Replace if necessary.

8.6.6 Re-fit the mattress cover & make sure all internal retaining straps have been re-connected correctly.

9 Routine Maintenance Visual Checks & Performance Test Matrix

Visual check Actions Note Record SCU & Mattress serial numbers before starting inspection.	*Annual Service (12 month)*	*Rental Turn Round (less than 12months)*	*End of Warranty (2years)(start of extended warranty)*
Clean SCU & Mattress in accordance with infection control policy.	√	√	√
Visual checks SCU External			
All case parts for mechanical damage.	√	√	√
Check mains cable for damage.	√	√	√
Check mains cable fuse if fitted.	√	√	√
Replace external air filter.	√	*A/R*	√
Check for mechanical damage/operation			
Front panel.	√	√	√
Hanging hooks.	√	√	√
Mains cable cover plate.	√	√	√
Rear rubber anti-vibration strip.	√	√	√
Back rest detector socket.	√	√	√
CPR & Rating labels.	√	√	√
Rubber mounting feet.	√	√	√
All (10) case fixing screws in place & tight.	√	√	√
Air connector receptacle			
CPR button operation.	√	√	√
Air connector location keyway.	√	√	√
Micro-switch activation arms.	√	√	√
Tightness of mounting onto side panel.	√	√	√
Visual checks SCU Internal			
Check all looms for damage & connectors are properly in place.	√		√
Check all air pipes for signs of damage or ageing especially the Rotor Valve for correct order of connection.	√		√
Check circuit boards for signs of damage.	√		√
Check power supply board fuses. (2x1A ceramic)	√		√

Visual check Actions Continued Note Record SCU & Mattress serial numbers before starting inspection.	*Annual Service (12 month)*	*Rental Turn Round (less than 12months)*	*End of Warranty (2years)(start of extended warranty)*
Visual check Mattress External			
Check cover top & base for damage or excessive wear.	√	√	√
Check cable retention clips	√	√	√
Check operation of all retaining straps & fixing to cover.	√	√	√
Check fixing of carrying handles to cover.	√	√	√
Check back rest detector connector & cable that protrudes from the umbilical.	√	√	√
Check umbilical cover.	√	√	√
Check air connector for mechanical damage & screw fixings.	√	√	√
Check air connector block tightness and operation of transport mode.	√	√	√
Check air connector indicator label.	√	√	√
Visual check Mattress Internal			
Check air pipes for signs of damage (kinking) or loose connections.	√	√	√
Check all cell decks for signs of damage or deterioration.	√	√	√
Check all lower deck fixing poppers in place.	√	√	√
Check back rest sensor mounting & cable condition.	√	√	√
Check internal mounting straps.	√	√	√
Check inside of cover for signs of strike through.	√	√	√
Check all H pieces re-fitted correctly.	√	√	√

Performance Tests (with SCU open)	*Annual Service (12 month)*	*Rental Turn Round (less than 12 months)*	*End of Warranty (2years)(start of extended warranty)*
Connect SCU directly to mattress. Take care as live mains voltages are exposed.			
PRV test.	√	√	√
Rotor valve position.	√	√	√
Rotor valve noise while moving.	√	√	√
Performance Tests (with SCU closed & connected to mattress)	**Annual Service (12 month)**	**Rental Turn Round (less than 12 months)**	**End of Warranty (2years)(start of extended warranty)**
Connect SCU to mattress using Test Adaptor & Pressure Test Gauge Test Station or Digital Pressure Monitor Kit & PC.			
Electrical safety check. (500v insulation)	√	√	√
Check fault log with SDIU.	√	√	√
Check Last home & back lash readings with SDIU.	√	√	√
Reset service indicator.	√	√	√
Power off/on switch.(Post Jan 2010 models only) Power switches correctly & green internal lamp comes on.	√	√	√
Start up sequence. (pre Jan 2010 models only)			
All LEDs flash once.	√	√	√
Single alarm Tone.	√	√	√
Fast inflate mode.	√	√	√
Pressure & cycle check Alternating Mode. (60mmHG)	√	√	√
Pressure check Static mode. (45 mmHG)	√	√	√
Mode control.	√	√	√
Go Button. (Panel unlock)	√	√	√
CPR alarm audio/visual.	√	√	√
Pressure adjust control. (+/-)	√	√	√
Power fail alarm.	√	√	√
Alarm Mute.	√	√	√
Back rest raise.	√	√	√
Seat mode.	√	√	√
Battery back up.	If fitted	If fitted	If fitted

Performance tests Continued (with SCU closed & connected to mattress)	Annual Service (12 month)	Rental Turn Round (less than 12 months)	End of Warranty (2years)(start of extended warranty)
Connect SCU to mattress using Test Adaptor & Pressure Test Gauge Test Station or Digital Pressure Monitor Kit & PC.			
General Noise level when compressor running.	√	√	√
General Vibration level when compressor running.	√	√	√
Perform any outstanding field upgrades.	A/R	A/R	A/R
Load service data with SDIU.	√	√	√

Care must be taken when connecting the SCU to the electrical mains supply due to the internal workings being exposed.

10 Fault Finding

Fault codes can be viewed via the SCU front panel display, or when using a SDIU (Service Data Interface Unit). When using the front panel display you will only see fault codes 1 to 6. Fault codes 7 and above can only be accessed using an SDIU, see figure 09. The SDIU is a remote device that accesses the SCU diagnostic data via an Infer-Red signal. The SDIU is only available to qualified Linet personnel, or if you have received formal Linet training beforehand.

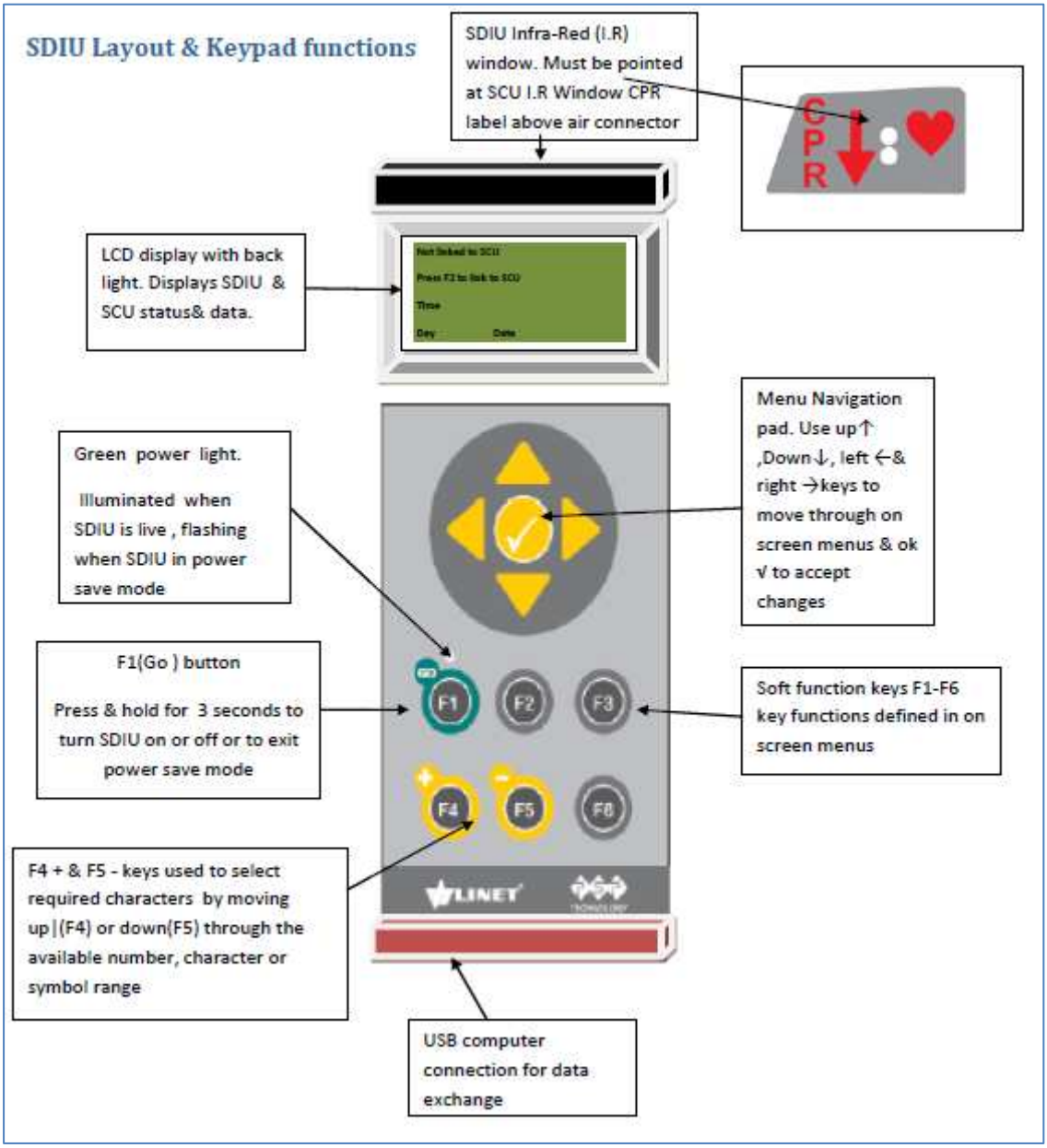

SDIU Layout & Keypad functions
SDIU Infra-Red (I.R) window. Must be pointed at SCU I.R Window CPR label above air connector
CPR
LCD display with back light. Displays SDIU & SCU status& data.
Menu Navigation pad. Use up↑ ,Down↓, left ←& right →keys to move through on screen menus & ok √ to accept changes
Green power light.
Illuminated when SDIU is live , flashing when SDIU in power save mode
F1(Go) button
Press & hold for 3 seconds to turn SDIU on or off or to exit power save mode
F1
F2
F3
Soft function keys F1-F6 key functions defined in on screen menus
F4
F5
F6
F4 + & F5 - keys used to select required characters by moving up↑(F4) or down(F5) through the available number, character or symbol range
LINET
USB computer connection for data exchange

Fig 09

10.1 Fault Codes (1 to 6)

Fault Condition	Fault condition details	Fault Indication	Check
Mains power indicator not on.	Green mains power indictor on front panel remains off when mains power is applied to the SCU. (Virtuoso)	Green mains power indictor on front panel remains off. (Virtuoso)	Mains cable is plugged in and there is power available at the outlet socket. Check cable fuse if fitted. SCU will turn on if Go button held for 2.5 seconds. If no then front panel will need to be replaced. (Virtuoso).
	Green mains power indictor on side panel remains off when mains power is applied to the SCU. (Virtuoso manufactured from January 2010 onwards)	Green mains power indictor on side panel remains off. (Virtuoso manufactured from January 2010 onwards)	SCU will turn on if mains switch turned on. If no then mains switch will need to be replaced. (Virtuoso plus).
Power failure audio. alarm	Mains power removed or battery power falls below 25%charge level in Battery mode.	Audio alarm sounds unless muted using front panel control or mains power is returned.	Mains cable is plugged in and there is power available at the outlet socket. Check and replace as required fuses in mains plug & on Power supply board.
SCU does not start.	Go Button held for 2.5 seconds, (Virtuoso) or mains switch turned on. (Virtuoso manufactured from January 2010 onwards) & nothing happens.	Green mains power indictor on front panel remains on. (Virtuoso) Green mains power indictor on side panel remains on. (Virtuoso manufactured from January 2010 onwards)	Check fuses on power supply circuit board.

Code Number	Fault condition details	Fault Indication	Check
Code 1 Failure to inflate during fast inflate mode, either at power on or during recovery from loss of air pressure.	Pressure sensor does not detect 45mmHg achieved in all cell groups within 30 minutes or 15mmhg within 15 minutes from start of fast inflate.	Fault LED flashes once in every 6 seconds. Audio alarm sounds. System will not keep trying to run but alarm will remain until cleared by power on/off or standby mode select/deselect.	See level 1 diagnostic chart.
Code 2 Failure to inflate during any mode.	Activated if any single cell group or groups take more than 2 minutes to reach selected pressure.	Fault LED flashes twice in every 6 seconds & Audio alarm sounds double beep. System will not keep trying to run but alarm will remain until cleared by power on/off or standby mode select/deselect.	See level 1 diagnostic chart.
Code 3 Failure to Alternate or Static cell fault.	Pressure sensor does not detect selected cell pressure have been achieved in a cell group or any cell group has not reduced to <5mmHg at twice in consecutive cycles.	Fault LED flashes three times in every 6 seconds & Audio alarm sounds triple beep. System will not keep trying to run & alarm will remain until cleared by power on/off or standby mode select/deselect.	See level 1 diagnostic chart.
Code 4 Inflate to fast during any mode	Cell pressure in any cell group in alternating mode reaches set pressure during inflation in less than 5 seconds after cell low pressure has been established.	Fault LED flashes four times in every 6 seconds & Audio alarm sounds 4 beeps .System will not keep trying to run but alarm will remain until cleared by power on/off or standby mode select/deselect.	See level 1 diagnostic chart.
Code 5 Multiple over inflation during any mode	If any cell when inflating in any mode reaches a pressure of greater than 75mmHG for 15 seconds.(note for SCU software version 2.35 and later this fault condition must occur twice before a code 5 fault is indicated. (see code 7)	Fault LED flashes five times in every 6 seconds & Audio alarm sounds 5 beeps .System will stop trying to inflate and close all inflated cells. Alarm will remain until cleared by power on/off or standby mode select/deselect.	See level 1 diagnostic chart.
Code 6	Major sensor fault –all sensors read 1mmHg or less	Mattress goes flat; fault LED flashes six times in every 6 seconds & Audio alarm sounds 6 beeps. System will stop trying to inflate and close all inflated cells. Alarm will remain until cleared by power on/off or standby mode select/deselect.	See level 1 diagnostic chart.

10.2 Fault Codes (7 onwards)

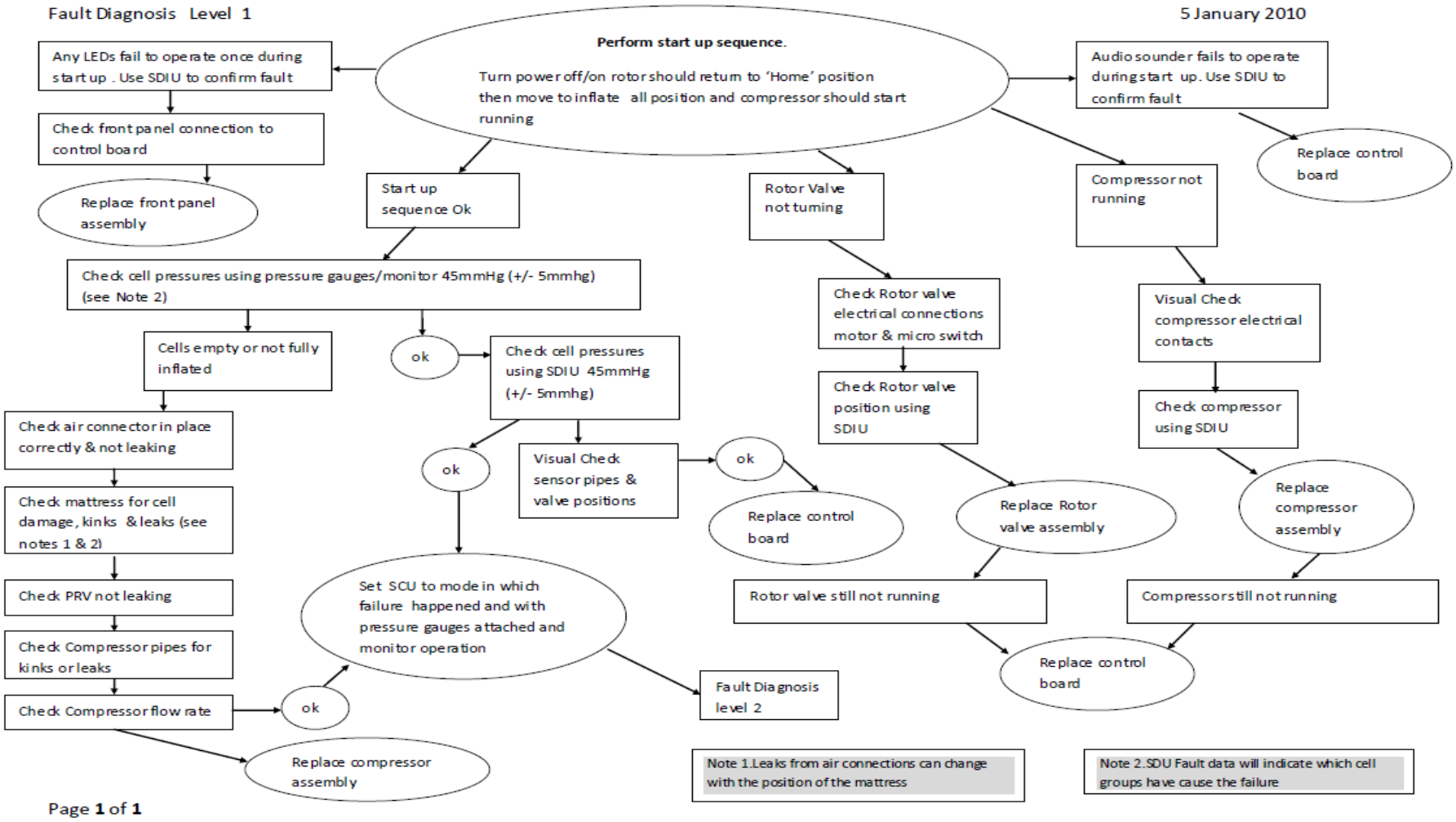
Fault Condition	Fault condition details	Fault Indication	Check
Code 7 single over inflation during any mode. (SCU software version 2.35 & later only)	If any cell when inflating in any mode reaches a pressure of greater than 75mmHG for 15 seconds. (Note if this fault condition occurs twice a code 5 fault is indicated)	SCU will return to fast inflate mode & record the code 7 fault in its fault log.	See level 1 diagnostic chart.
Code 10	CPR mode entered by removing air connector.	This code can only be seen by checking the fault log using the SDIU. (see SDIU User Guide)	N/a.
Code 11	Power Failure when not in standby mode. (Virtuoso) Power turned off using on /off switch of by mains failure. (Virtuoso manufactured from January 2010 onwards)	This code can only be seen by checking the fault log using the SDIU. (see SDIU User Guide)	N/a.
Code 14	Run time reset by SDIU.	This code can only be seen by checking the fault log using the SDIU. (see SDIU User Guide)	N/a.
Code 15	Fault self cleared.	This code can only be seen by checking the fault log using the SDIU. (see SDIU User Guide)	

10.3 Resetting Power on Hours

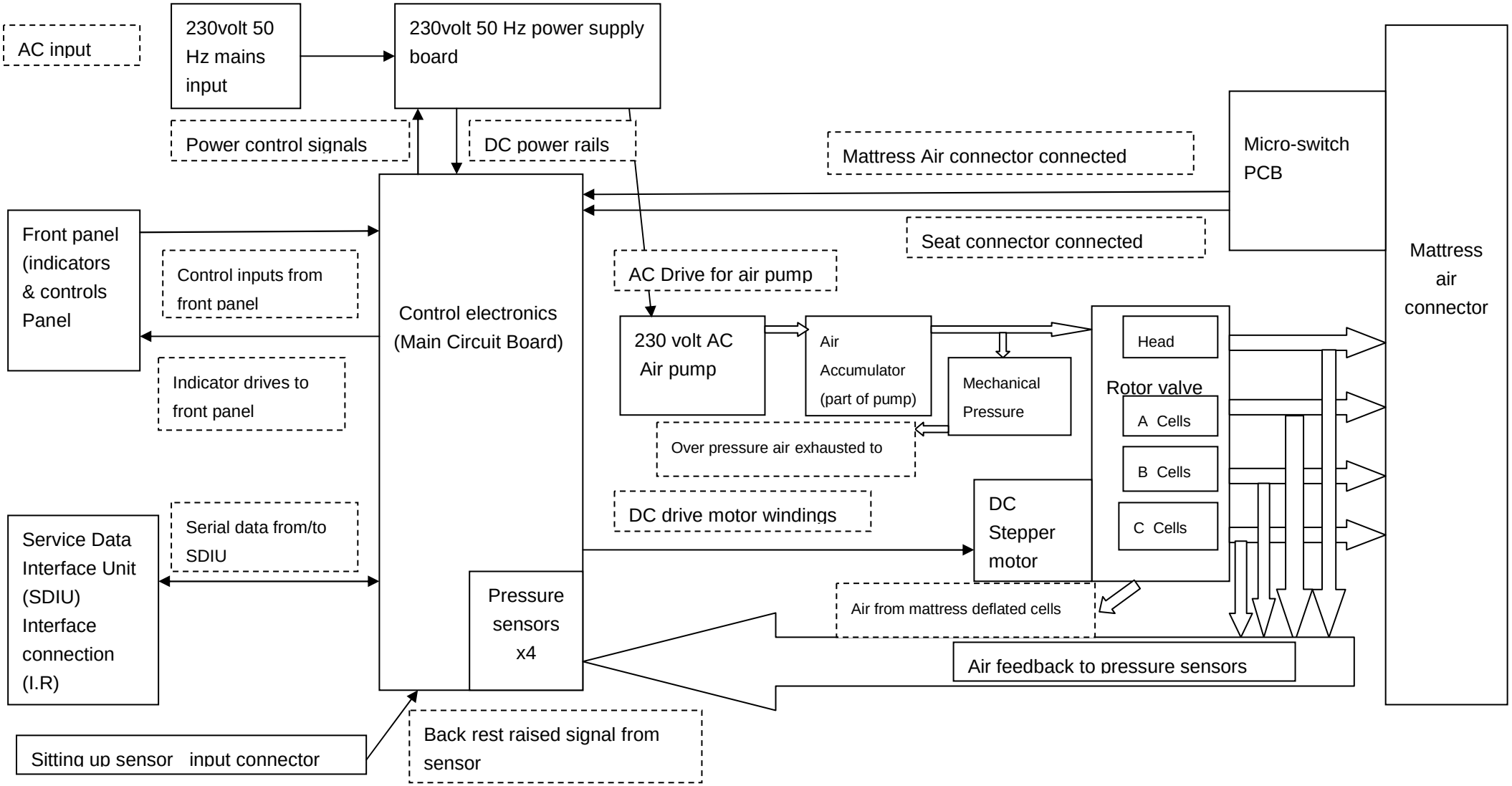
See SDIU User Guide

11 Fault Diagnosis Level 1

This flow chart can be used with the aid of the SDIU and a suitable pressure measurement device, to diagnose single fault conditions. Repairs can then be achieved by replacing the failed parts with new spare parts. Units with multiple faults may be diagnosed using this method but may require several passes through this process. Complex multiple or intermittent faults will require level 2 diagnostics which are covered as part of Linet service training courses.


Fault Diagnosis Level 1
5 January 2010
Perform start up sequence.
Turn power off/on rotor should return to 'Home' position then move to inflate all position and compressor should start running
Any LEDs fail to operate once during start up . Use SDIU to confirm fault
Check front panel connection to control board
Replace front panel assembly
Start up sequence Ok
Rotor Valve not turning
Audio sounder fails to operate during start up. Use SDIU to confirm fault
Replace control board
Compressor not running
Check cell pressures using pressure gauges/monitor 45mmHg (+/- 5mmhg) (see Note 2)
Cells empty or not fully inflated
ok
Check cell pressures using SDIU 45mmHg (+/- 5mmhg)
Check Rotor valve electrical connections motor & micro switch
Visual Check compressor electrical contacts
Check air connector in place correctly & not leaking
Check mattress for cell damage, kinks & leaks (see notes 1 & 2)
Check PRV not leaking
Check Compressor pipes for kinks or leaks
Check Compressor flow rate
ok
Replace compressor assembly
ok
Visual Check sensor pipes & valve positions
ok
Replace control board
Set SCU to mode in which failure happened and with pressure gauges attached and monitor operation
Fault Diagnosis level 2
Check Rotor valve position using SDIU
Replace Rotor valve assembly
Rotor valve still not running
Replace control board
Check compressor using SDIU
Replace compressor assembly
Compressors still not running
Replace control board
Note 1.Leaks from air connections can change with the position of the mattress
Note 2.SDU Fault data will indicate which cell groups have cause the failure
Page 1 of 1

12 Schematic Drawing



13 Environmental Conditions

Environmental Conditions	
Ambient Temperature	0℃ (32F) to +40℃ (104F)
Shipping Conditions (air humidity)	30% to 75%
Dust and Water Protection	IP 3X
Flammability Rating (mattress and cushion covers)	BS 7175 ignition sources 0,1 and 5
Environmental	ISO 14001, 2002/95/EC (RoHS), 2002/96/EC (WEEE)
EMC	BS EN 60601-1-2

14 Technical Specifications

The Virtuoso Mattress Replacement System consists of two separate decks. The top deck consists of two smaller modules. The bottom deck is made of single head, torso and leg sections encased by two side formers. All sections are held in registration using stainless steel press studs, location toggles and polyurethane (PU) loops.

Mattress

Mattress Structure	
Top Deck	*Two separate sections*
Static	3 Head cells (transverse)
Alternating	17 cells (transverse)
Bottom Deck	*Separate Head, Torso and Leg sections encased by two Side formers*
Static	3 Head and 5 Leg cells (longitudinal), Side formers
Alternating	9 Torso cells (transverse)

NOTE: The side formers are approximately 40% larger than dynamic cells.

Mattress Cont

Description	Value
Mattress Replacement	
Nominal Dimensions (Inflated)	2040 x 880 x 230 mm (long x wide x high) (Note Models manufactured from June 2010 are 860 wide)
Weight	9.5 kg
Cycle	3 cell cycle, 7.5 min
Cushion	
Nominal Dimensions (Inflated)	450 x 500 x 125 mm (deep x wide x high)
Weight	2.5 kg
Cycle	2 cell cycle, 12 min
Control Unit	
Nominal Dimensions (Excluding Battery)	135 x 360 x 290 mm (deep x wide x high)
Weight (Excluding Battery)	3.5 kg

Technical Part 1

Description	Value
Inflation Time	
Transport Mode	Minimum of 24 hours
Storage to Inflation	10 - 30 minutes
CPR Deflation	Maximum of 30 seconds
Load Capacity	254 kg, 40 St, 560 lbs

Technical Part 2

Description	Values
Supply Voltage	220/240Vac 50Hz (Mains)14V DC (Battery)
Power Rating	Maximum 40VA (Mains)
Fuse Rating	1A Anti-surge (x2)
Noise Level	NC30 (For use in a quiet domestic environment)
Electrical Safety	Conforms to EN60601-1-1
Classification	Class II, Type B
Mode of Operation	Continuous
Cycle Control	Purpose designed distributor valve supplying operating air to the inflatable cells.

Although this equipment complies with the EMC requirements defined in EN 60601-1-2 care should be taken not to use this product in close proximity to sources of radio frequency energy or other equipment that has not been approved to this standard and whose performance could effect this product or be effected by conducted or radiated electromagnetic fields from this product.

15 Environmental Protection

15.1 Material Used

Linet are supportive of protecting the environment therefore great attention is taken, during development, planning and production to use materials that are environmentally friendly. Linet Mattress products do not contain dangerous substances such as cadmium, mercury, asbestos or PCB/CFC's.

The operational noise-level of the product meets the requirements for the protection of public health against undesirable noise and vibration in protected indoor buildings. All product packaging is marked in accordance with the legal regulations. This should be disposed of in accordance with your local waste disposal policy.

15.2 Disposal of Parts

Mattress parts removed should be disposed of in accordance with your local waste disposal policy.

Mattress products displaying this symbol indicate they are fitted with lead batteries.

Mattress products displaying this symbol indicate that electrical/electronic components have been using in the manufactiring of the product. Products displaying this marking must not be disposed/destroyed with communal waste. The waste of electrical products must conform to the OEEZ/WEEE directive.

Disposing of Dynamic Replacement Mattress System components appropriately, will help preserve valuable natural resources and help prevent potential negative effects on the environment and human health. You can request further details from authorized environmental protection authorities, or the closest collection point for separated waste collection. Protect your health and the environment. Thank you.

Fines may be imposed under national regulations if waste material is incorrectly disposed of.

16 Warranty and Service

The Virtuoso Mattress Replacement System is provided with a **24-month Warranty** commencing the date of delivery, unless the purchase contract states otherwise. The Warranty and Post-Warranty repairs are to be performed by Linet, or authorised service organisation based on a written certificate of competency. Written certification will only be given if the persons concerned have received Linet training.

- This product has been designed to be virtually maintenance free, apart from routine cleaning between service intervals.
- It is recommended that this product be part of a routine preventative maintenance schedule with a planned service every 12 months regardless of product usage.
- Linet will make available on request spare parts lists, circuit diagrams, product testing and servicing instructions for use by properly trained and qualified service personnel.

17 Contact Details.

For contact details of your local Linet service provider visit www.linet.cz.